



TEST REPORT

Applicant Name : Zeeva International Limited
Address : Suite 1007B, 10th Floor, Exchange Tower, 33 Wang Chiu Road,
Kowloon Bay, Hong Kong
Report Number : RA230113-02474E-RF-00
FCC ID: 2ADM5-EP-0675

Test Standard (s)

FCC PART 15.247

Sample Description

Product Type: SOLAR POWERBANK TWS
Model No.: EP-0675
Multiple Model(s) No.: N/A
Trade Mark: N/A
Date Received: 2023/01/13
Report Date: 2023/01/19

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Andy Yu
EMC Engineer

Approved By:

Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

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Shenzhen Accurate Technology Co., Ltd.

1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China
Tel: +86 755-26503290 Fax: +86 755-26503396 Web: www.atc-lab.com

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RA230113-02474E-RF-00	Original Report	2023/01/19

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

SKU number* (Barcode of product)	BLACK - 7410114, GREEN - 7410115(provided by the applicant)
UPC number* (Product code of applicant's internal system)	BLACK - 1922343551164, GREEN – 1922343551171 (provided by the applicant)
Frequency Range	Bluetooth: 2402~2480MHz
Maximum conducted Peak output power	Bluetooth: 1.31dBm
Modulation Technique	Bluetooth: GFSK, $\pi/4$ -DQPSK
Antenna Specification*	2.06dBi (provided by the applicant)
Voltage Range	DC3.7V from battery
Sample serial number	1YVB-1 for Radiated Emissions Test 1YVH-4 for RF conducted Test (Assigned by ATC)
Sample/EUT Status	Good condition

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.209 and 15.247 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Emissions, Radiated	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz - 26.5GHz	5.06dB
Temperature		1 °C
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

EUT Exercise Software

“FCC_assist_1.0.2.2”* software was used to test and the Power level is 10*.The software and power level was provided by the applicant.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

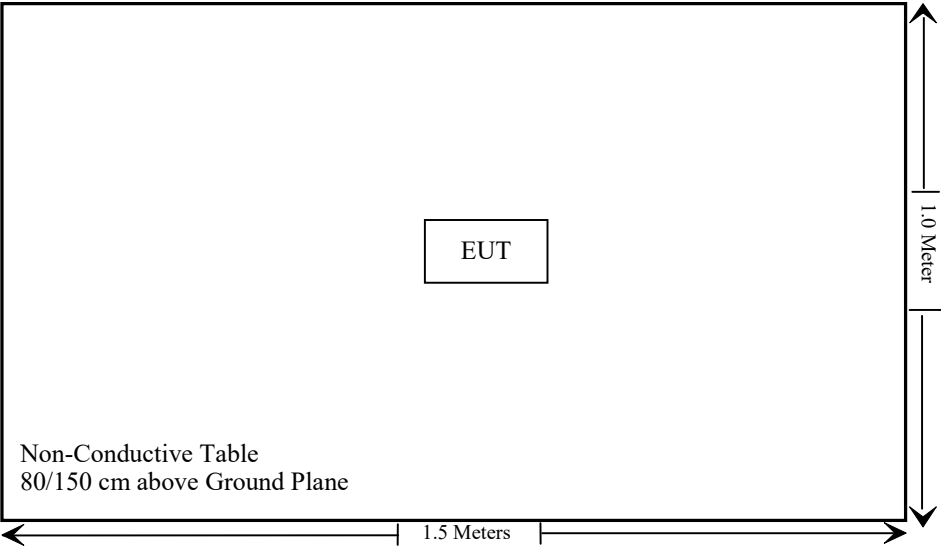
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup

For Radiated Emissions:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (3) & §2.1093	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliant
§15.247(a)(1)	20 dB Emission Bandwidth & 99% Occupied Bandwidth	Compliant
§15.247(a)(1)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	Peak Output Power Measurement	Compliant
§15.247(d)	Band edges	Compliant

Not Applicable: The Bluetooth function cannot use when charging..

Note: the left earbud and right earbud are electrical identical, pre-scan the two earbuds, the worst case Right earbud was selected to test.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated emission test					
Rohde& Schwarz	Test Receiver	ESR	102725	2022/11/25	2023/11/24
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
SONOMA INSTRUMENT	Amplifier	310 N	186131	2022/11/08	2023/11/07
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2022/11/08	2023/11/07
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2022/11/08	2023/11/07
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2022/11/30	2025/11/29
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2022/12/26	2025/12/25
Radiated Emission Test Software: e3 19821b (V9)					
Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.11	N1000	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.12	N040	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.13	N300	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.14	N800	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.15	N600	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.16	N650	2022/11/25	2023/11/24
Wainwright	High Pass Filter	WHKX3.6/18 G-10SS	5	2022/11/25	2023/11/24
RF conducted test					
Rohde&Schwarz	Spectrum Analyzer	FSV-40	101590	2022/11/25	2023/11/24
Tonscend	RF Control Unit	JS0806-2	19G8060182	2022/10/24	2023/10/23
WEINSCHHEL	10dB Attenuator	5324	AU 3842	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.31	RF-01	Each time	Each time

* **Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.247 (i), §1.1307 (b) (3) &§2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (3), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D04 Interim General RF Exposure Guidance

SAR-Based Exemption:

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum timeaveraged power or maximum time-averaged ERP, whichever is greater.

Per § 1.1307(b)(3)(i)(B), for single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

For worst case:

Exemption limit:

For $f=2.48\text{GHz}$, $d=0.5\text{cm}$, the $P_{th}=2.72\text{mW}$

The higher of the available maximum time-averaged power or effective radiated power (ERP):

The antenna gain is 2.06dBi (-0.09Bd), 0dBd=2.15dBi

The maximum tune-up conducted power is 1.5dBm (1.41mW), which less than 2.72 mW@2480MHz exemption limit

So the stand-alone SAR evaluation can be exempted.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has one internal Antenna arrangement, which was permanently attached and the antenna gain is 2.06dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

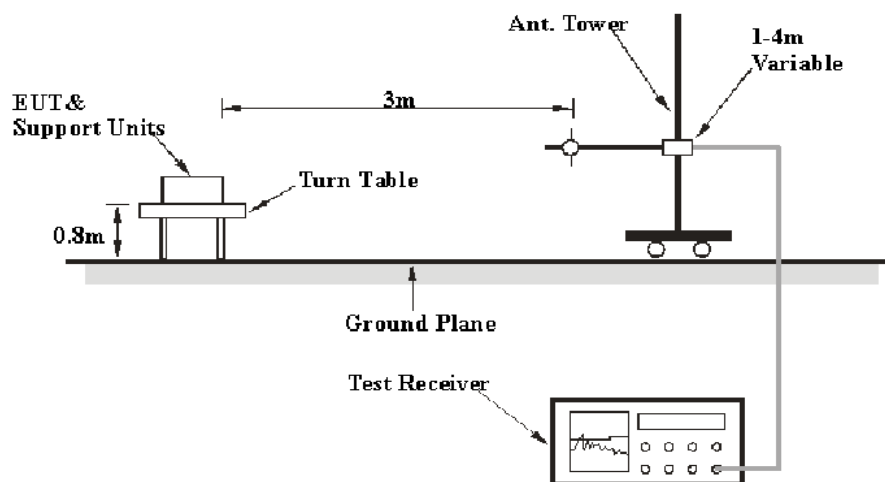
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

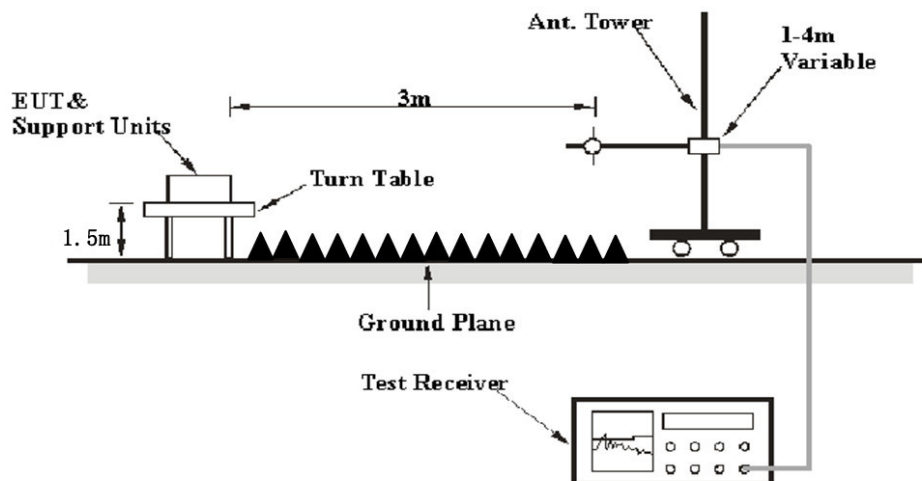
FCC §15.205; §15.209; §15.247(d)

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Average

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Factor & Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

$$\text{Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Over Limit/Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

$$\begin{aligned}\text{Over Limit/Margin} &= \text{Level / Corrected Amplitude} - \text{Limit} \\ \text{Level / Corrected Amplitude} &= \text{Read Level} + \text{Factor}\end{aligned}$$

Test Data

Environmental Conditions

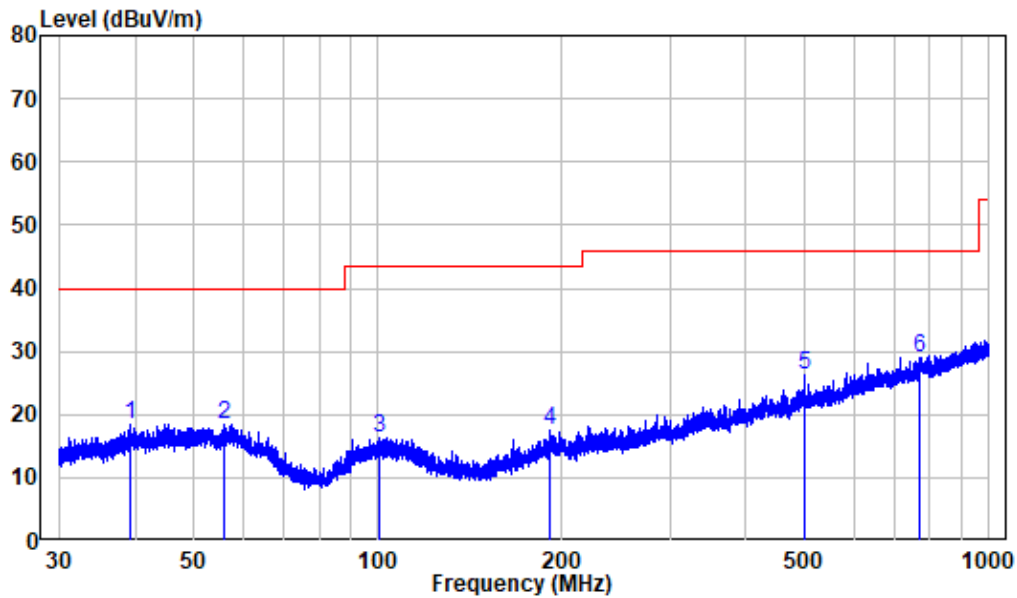
Temperature:	24~25.5 °C
Relative Humidity:	52~57 %
ATM Pressure:	101.0 kPa

The testing was performed by Jimi Zheng on 2023-01-17 for below 1GHz and Jason Liu on 2023-01-17 for above 1GHz.

EUT operation mode: Transmitting

30MHz-1GHz: (worst case is GFSK Mode, Low channel)

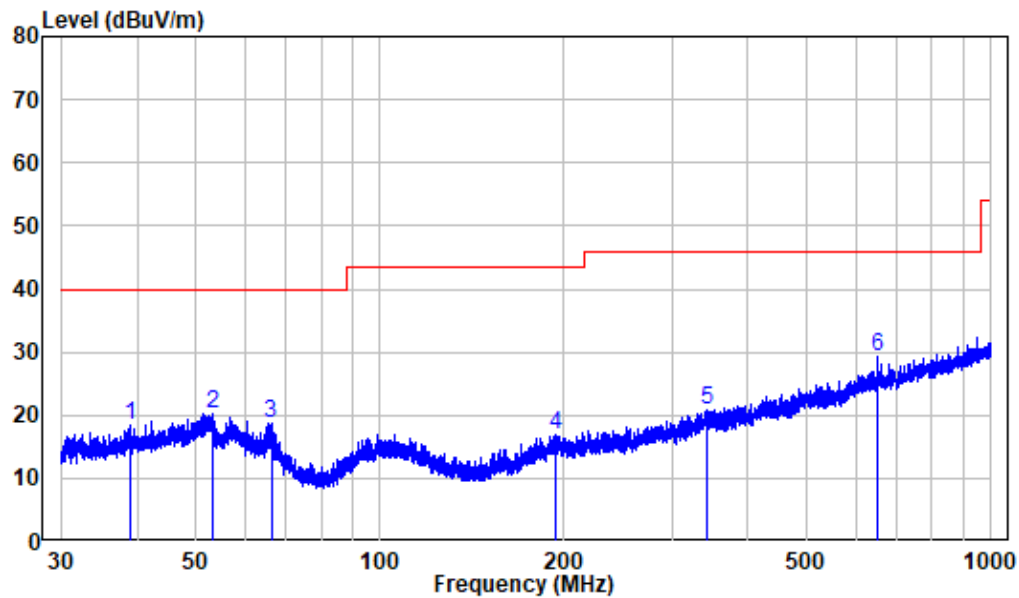
Note: When the test result of peak was less than the limit of QP more than 6dB, just peak value were recorded.

Horizontal:

Site : chamber
Condition: 3m HORIZONTAL
Job No. : RA230113-02474E-RF
Test Mode: BT Transmitting

	Freq Factor		Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	39.247	-10.52	28.86	18.34	40.00	-21.66	Peak
2	55.878	-10.20	28.70	18.50	40.00	-21.50	Peak
3	100.713	-11.72	28.10	16.38	43.50	-27.12	Peak
4	191.241	-11.37	28.77	17.40	43.50	-26.10	Peak
5	498.768	-4.31	30.46	26.15	46.00	-19.85	Peak
6	768.748	-0.25	29.37	29.12	46.00	-16.88	Peak

Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No. : RA230113-02474E-RF
 Test Mode: BT Transmitting

	Freq Factor		Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	39.127	-10.55	29.03	18.48	40.00	-21.52	Peak
2	53.015	-10.17	30.44	20.27	40.00	-19.73	Peak
3	66.295	-13.02	31.69	18.67	40.00	-21.33	Peak
4	194.028	-11.31	28.30	16.99	43.50	-26.51	Peak
5	343.632	-7.27	28.13	20.86	46.00	-25.14	Peak
6	653.086	-1.64	31.00	29.36	46.00	-16.64	Peak

Above 1GHz: (Scan with GFSK, $\pi/4$ -DQPSK mode, the worst case is GFSK Mode)

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
Low Channel(2402MHz)									
2310	61.08	PK	355	2.3	H	-7.24	53.84	74	-20.16
2310	60.89	PK	73	2.4	V	-7.24	53.65	74	-20.35
2390	64.05	PK	168	2.4	H	-7.22	56.83	74	-17.17
2390	63.72	PK	186	2.3	V	-7.22	56.50	74	-17.50
4804	62.43	PK	130	1.1	H	-3.51	58.92	74	-15.08
4804	60.28	PK	320	1.1	V	-3.51	56.77	74	-17.23
Middle Channel (2441 MHz)									
4882	62.70	PK	258	1.3	H	-3.37	59.33	74	-14.67
4882	60.94	PK	279	1.3	V	-3.37	57.57	74	-16.43
High Channel (2480 MHz)									
2483.5	64.43	PK	60	2.3	H	-7.20	57.23	74	-16.77
2483.5	64.03	PK	274	2.4	V	-7.20	56.83	74	-17.17
2500	62.56	PK	14	1.9	H	-7.18	55.38	74	-18.62
2500	63.52	PK	256	1.1	V	-7.18	56.34	74	-17.66
4960	62.30	PK	79	1.7	H	-3.01	59.29	74	-14.71
4960	60.26	PK	95	1.7	V	-3.01	57.25	74	-16.75

Field Strength of Average							
Frequency (MHz)	Peak Measurement @3m (dBμV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247		
					Limit (dBμV/m)	Margin (dB)	Comment
Low Channel 2402MHz							
2310	53.84	H	-24.84	29.00	54	-25.00	Band Edge
2310	53.65	V	-24.84	28.81	54	-25.19	Band Edge
2390	56.83	H	-24.84	31.99	54	-22.01	Band Edge
2390	56.50	V	-24.84	31.66	54	-22.34	Band Edge
4804	58.92	H	-24.84	34.08	54	-19.92	Harmonic
4804	56.77	V	-24.84	31.93	54	-22.07	Harmonic
Middle Channel 2441MHz							
4882	59.33	H	-24.84	34.49	54	-19.51	Harmonic
4882	57.57	V	-24.84	32.73	54	-21.27	Harmonic
High Channel 2480MHz							
2483.5	57.23	H	-24.84	32.39	54	-21.61	Band Edge
2483.5	56.83	V	-24.84	31.99	54	-22.01	Band Edge
2500	55.38	H	-24.84	30.54	54	-23.46	Band Edge
2500	56.34	V	-24.84	31.50	54	-22.50	Band Edge
4924	59.29	H	-24.84	34.45	54	-19.55	Harmonic
4924	57.25	V	-24.84	32.41	54	-21.59	Harmonic

Corrected, Amplitude = Corrected Factor + Reading
Margin = Corrected, Amplitude - Limit
Average level= Peak level+ Duty Cycle Corrected Factor

$$\text{Duty cycle} = T_{on}/100\text{ms} = 2.8625 \times 2/100 = 0.05725$$
$$\text{Duty Cycle Corrected Factor} = 20\lg(\text{Duty cycle}) = 20\lg 0.05725 = -24.84$$

Spectrum

Ref Level 0.00 dBm

Att 10 dB

SWT 100 ms

RBW 3 MHz

VBW 3 MHz

SGL

1Rm Clrw

D1 [1] -0.06 dB

M1 [1] 2.8625 ms

D1 -52.848 dBm

M1 -46.87 dBm

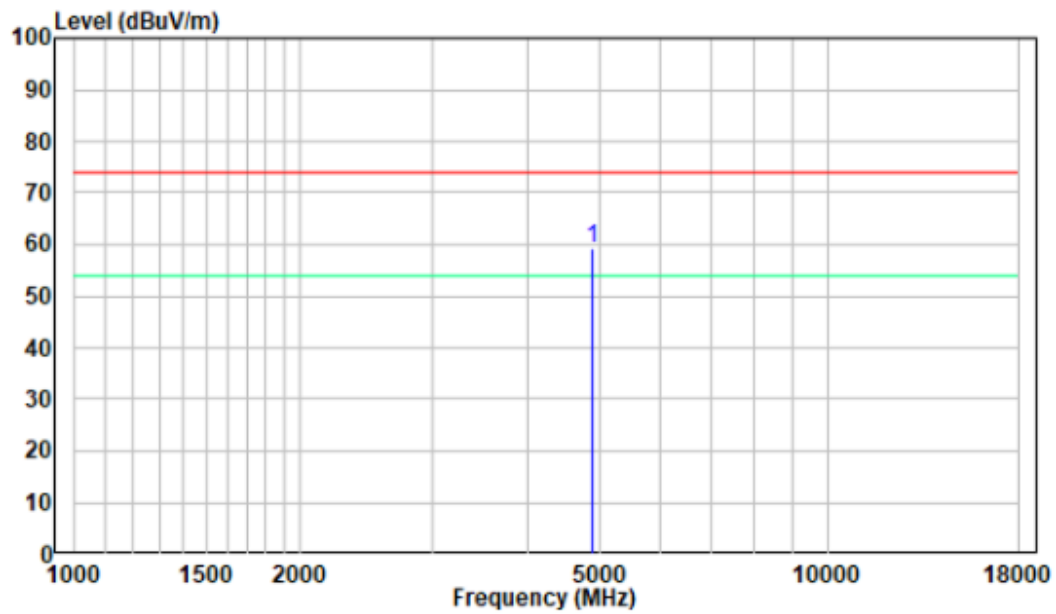
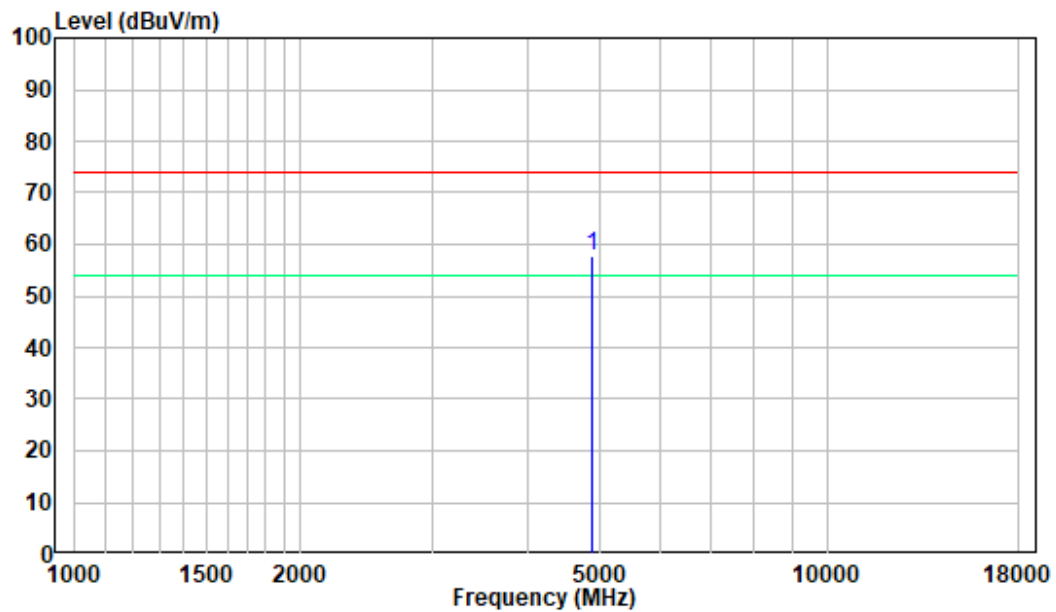
D1 31.1750 ms

CF 2.441 GHz

8001 pts

10.0 ms

Date: 17.JAN.2023 15:22:10

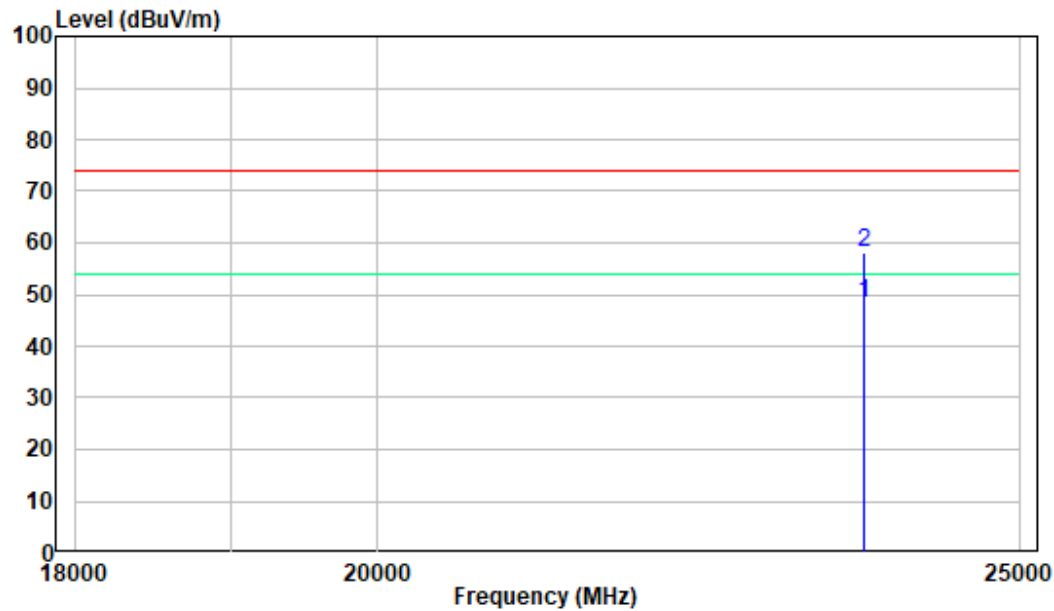
1-18GHz**Pre-scan plot****Middle Channel****Horizontal:****Vertical:**

18-25GHz

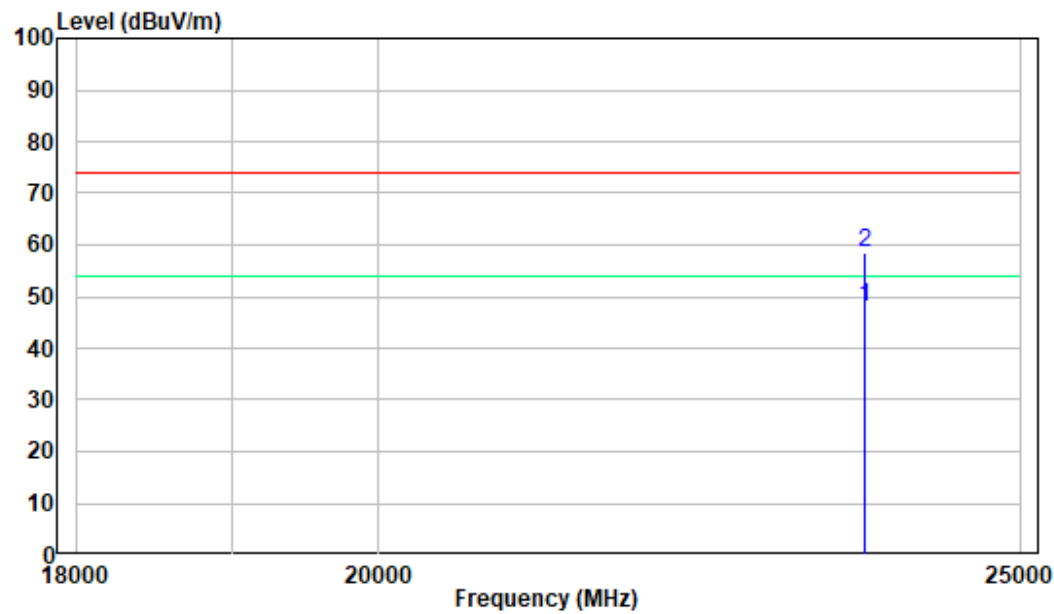
Pre-scan plot

Middle Channel

Horizontal:



Vertical:



FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

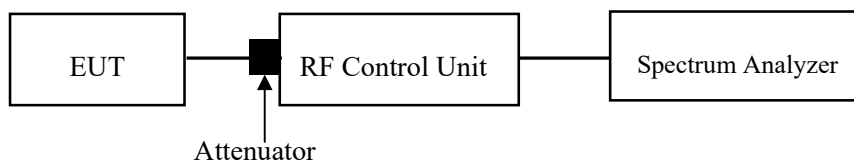
Applicable Standard

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.2

1. Set the EUT in transmitting mode, maxhold the channel.
2. Set the adjacent channel of the EUT and maxhold another trace.
3. Measure the channel separation.



Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by Glenn Jiang on 2023-01-17.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH & 99% OCCUPIED BANDWIDTH

Applicable Standard

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Procedure

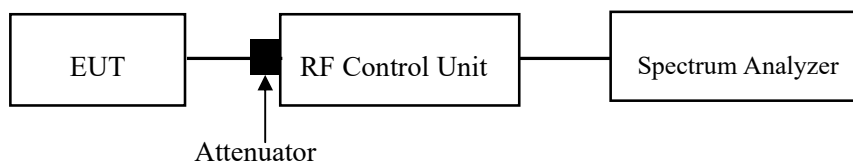
Test Method: ANSI C63.10-2013 Clause 7.8.7 & Clause 6.9.2

The following conditions shall be observed for measuring the occupied bandwidth and 20 dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / 20 dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / 20 dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).



Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by Glenn Jiang on 2023-01-17.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

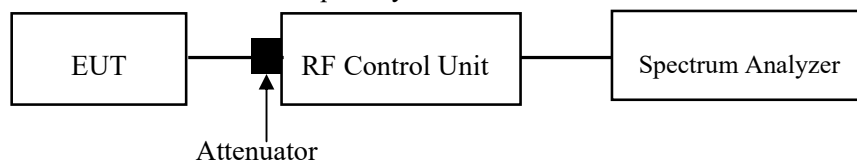
FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST**Applicable Standard**

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.3

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the max-hold function record the quantity of the channel.

**Test Data****Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by Glenn Jiang on 2023-01-17.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

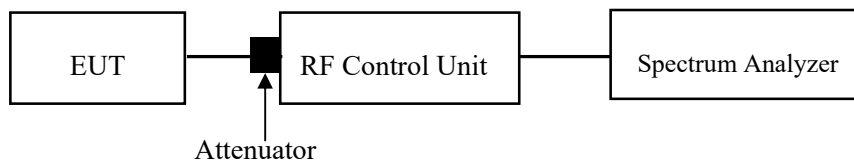
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)**Applicable Standard**

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.4

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW $\geq 3 \times$ RBW.
4. Set the span to 0Hz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Recorded the time of single pulses

**Test Data****Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by Glenn Jiang on 2023-01-17.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

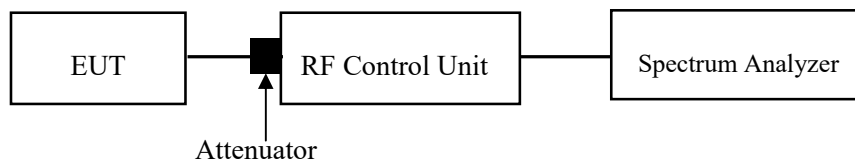
Applicable Standard

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.5

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by Glenn Jiang on 2023-01-17.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(d) - BAND EDGES TESTING

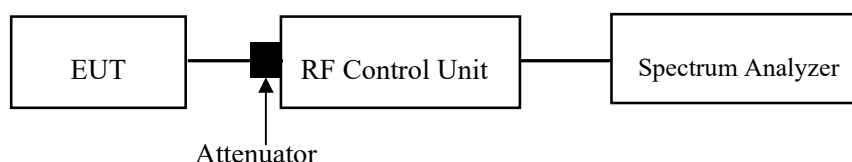
Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.6 & Clause 6.10

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by Glenn Jiang on 2023-01-17.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

APPENDIX

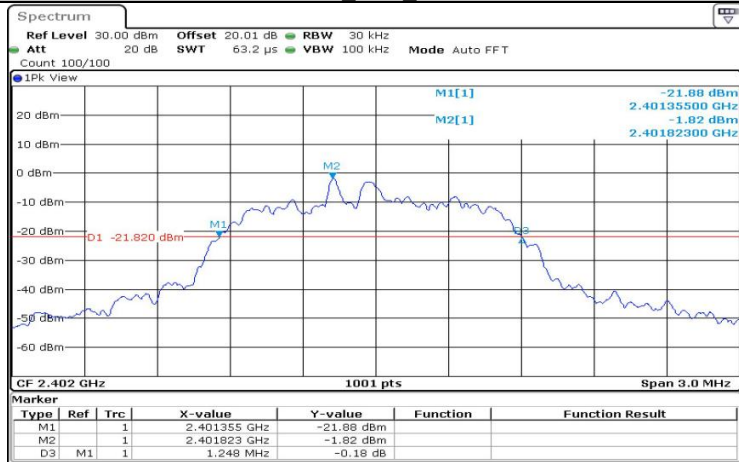
Appendix A: 20dB Emission Bandwidth Test Result

Test Mode	Antenna	Freq(MHz)	20dB EBW[MHz]	Limit[MHz]	Verdict
DH1	Ant1	2402	0.89	---	---
		2441	0.89	---	---
		2480	0.89	---	---
2DH1	Ant1	2402	1.25	---	---
		2441	1.25	---	---
		2480	1.25	---	---

Test Graphs

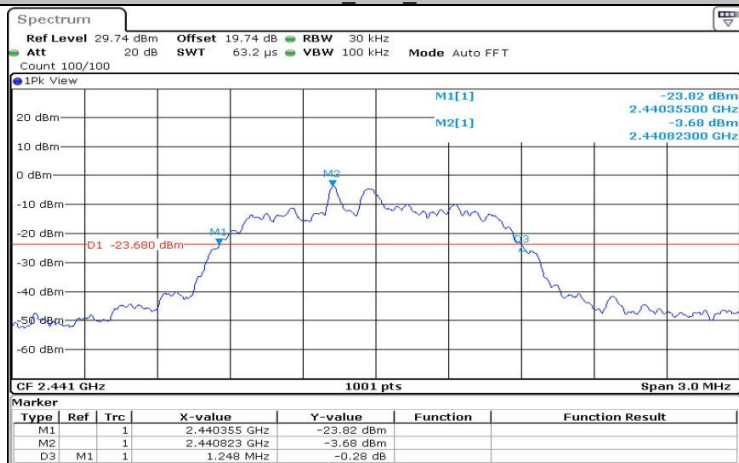


2DH1_Ant1_2402



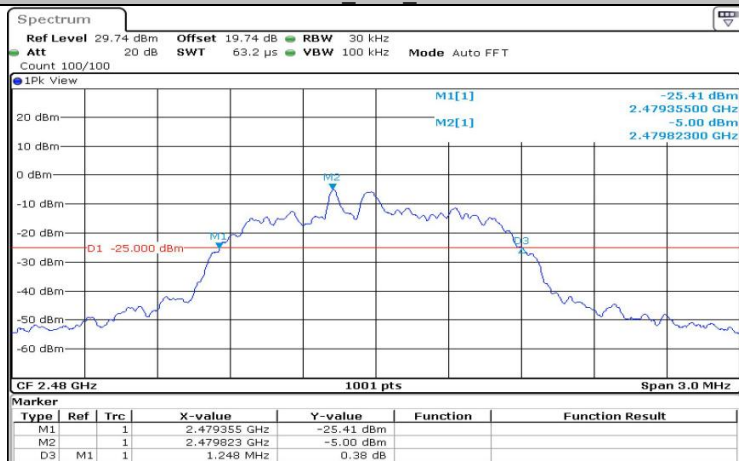
Date: 17.JAN.2023 20:41:46

2DH1_Ant1_2441



Date: 17.JAN.2023 20:42:59

2DH1_Ant1_2480



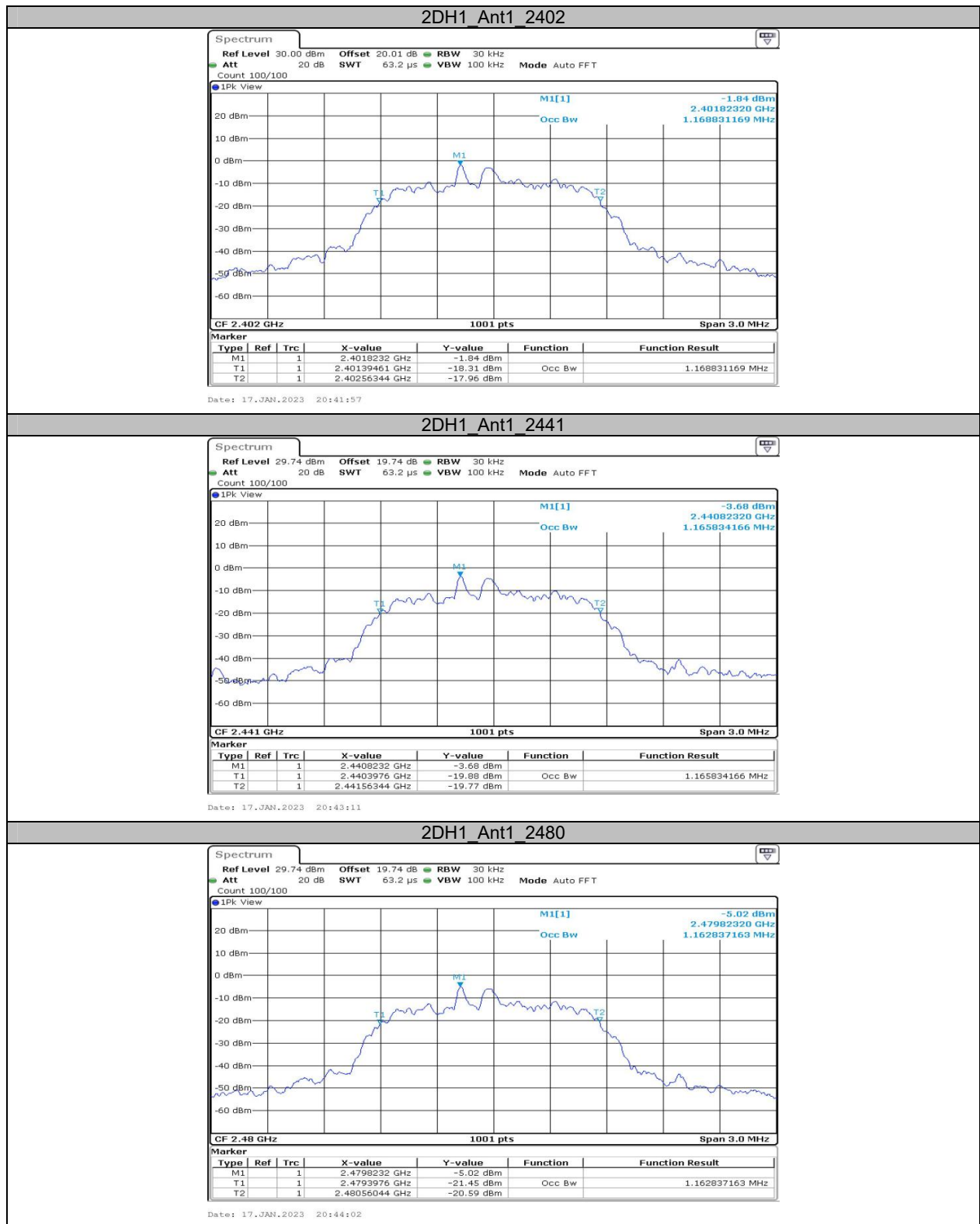
Date: 17.JAN.2023 20:43:51

**Appendix B: Occupied Channel Bandwidth
Test Result**

Test Mode	Antenna	Freq(MHz)	OCB [MHz]	Limit[MHz]	Verdict
DH1	Ant1	2402	0.848	---	---
		2441	0.854	---	---
		2480	0.851	---	---
2DH1	Ant1	2402	1.169	---	---
		2441	1.166	---	---
		2480	1.163	---	---

Test Graphs

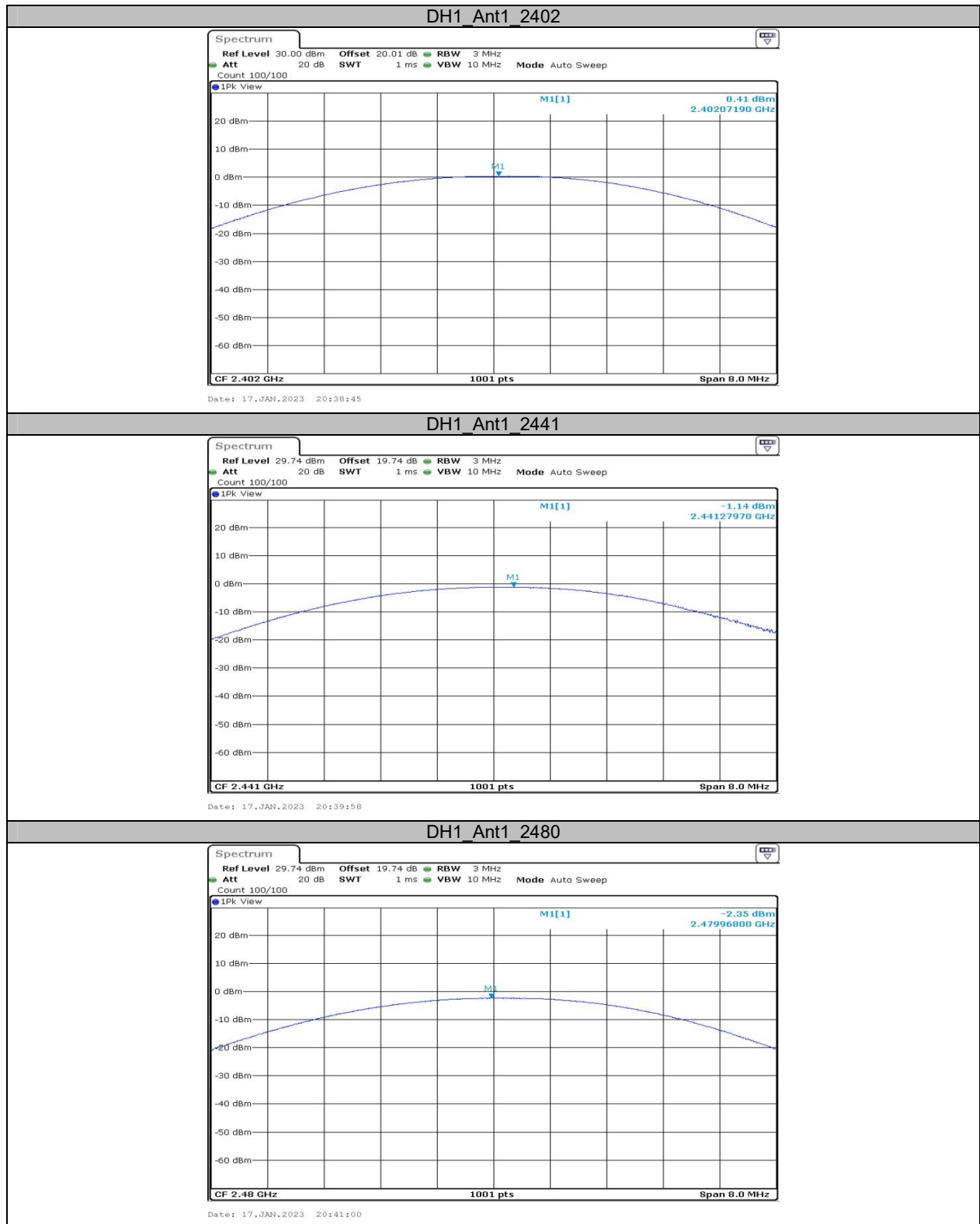




**Appendix C: Maximum conducted output power
Test Result**

Test Mode	Antenna	Freq(MHz)	Conducted Peak Power [dBm]	Conducted Limit [dBm]	Verdict
DH1	Ant1	2402	0.41	≤20.97	PASS
		2441	-1.14	≤20.97	PASS
		2480	-2.35	≤20.97	PASS
2DH1	Ant1	2402	1.31	≤20.97	PASS
		2441	-0.25	≤20.97	PASS
		2480	-1.47	≤20.97	PASS

Test Graphs

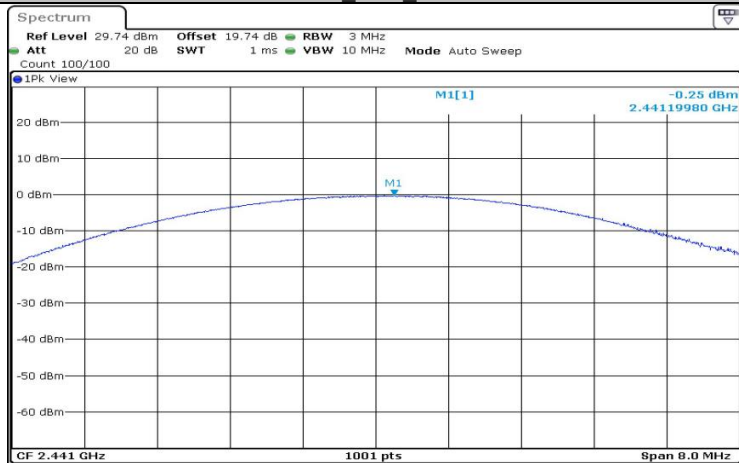


2DH1_Ant1_2402



Date: 17.JAN.2023 20:42:18

2DH1_Ant1_2441



Date: 17.JAN.2023 20:43:19

2DH1_Ant1_2480

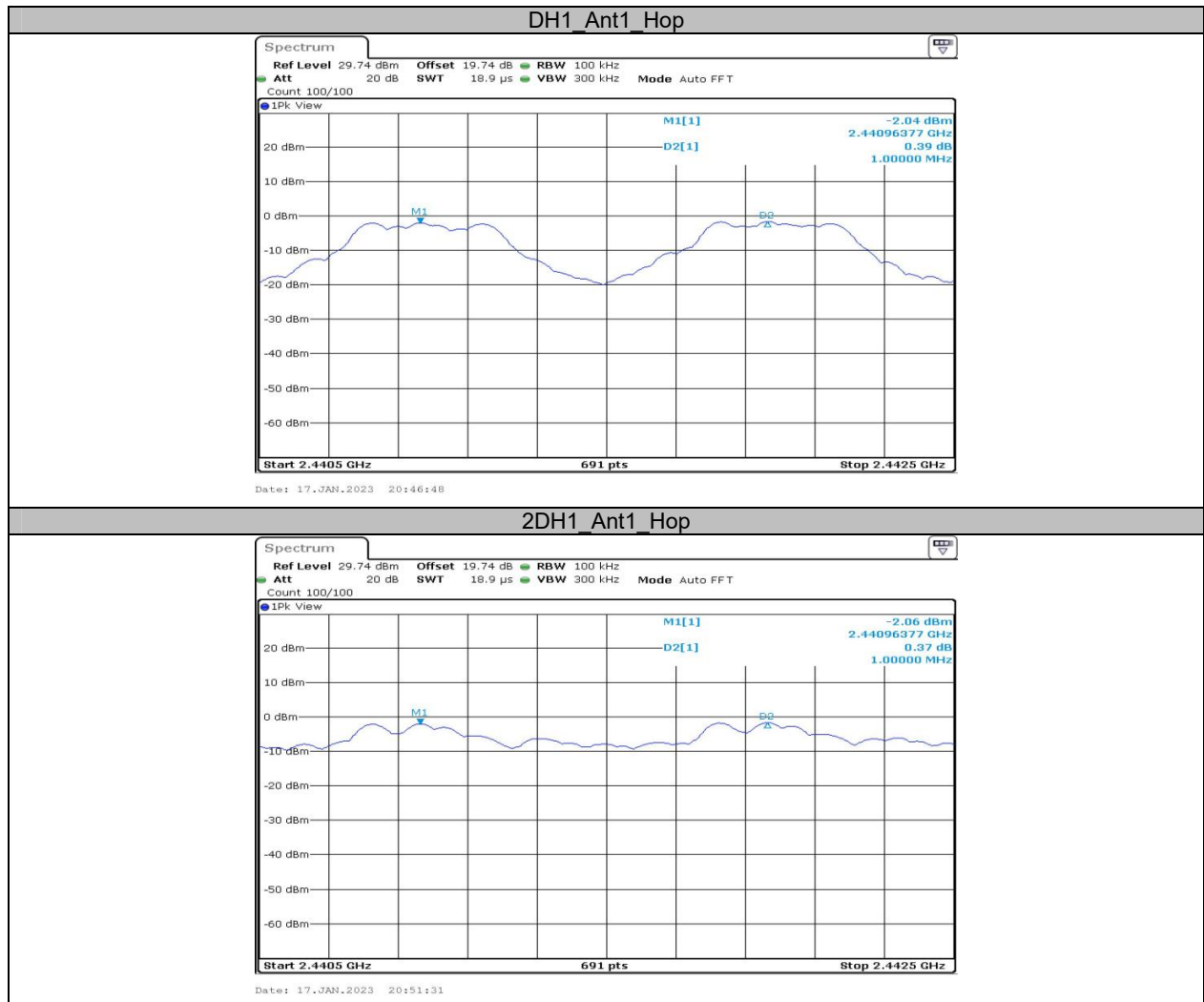


Date: 17.JAN.2023 20:44:27

**Appendix D: Carrier frequency separation
Test Result**

Test Mode	Antenna	Freq(MHz)	Result[MHz]	Limit[MHz]	Verdict
DH1	Ant1	Hop	1	≥ 0.593	PASS
2DH1	Ant1	Hop	1	≥ 0.833	PASS

Test Graphs



**Appendix E: Time of occupancy
Test Result**

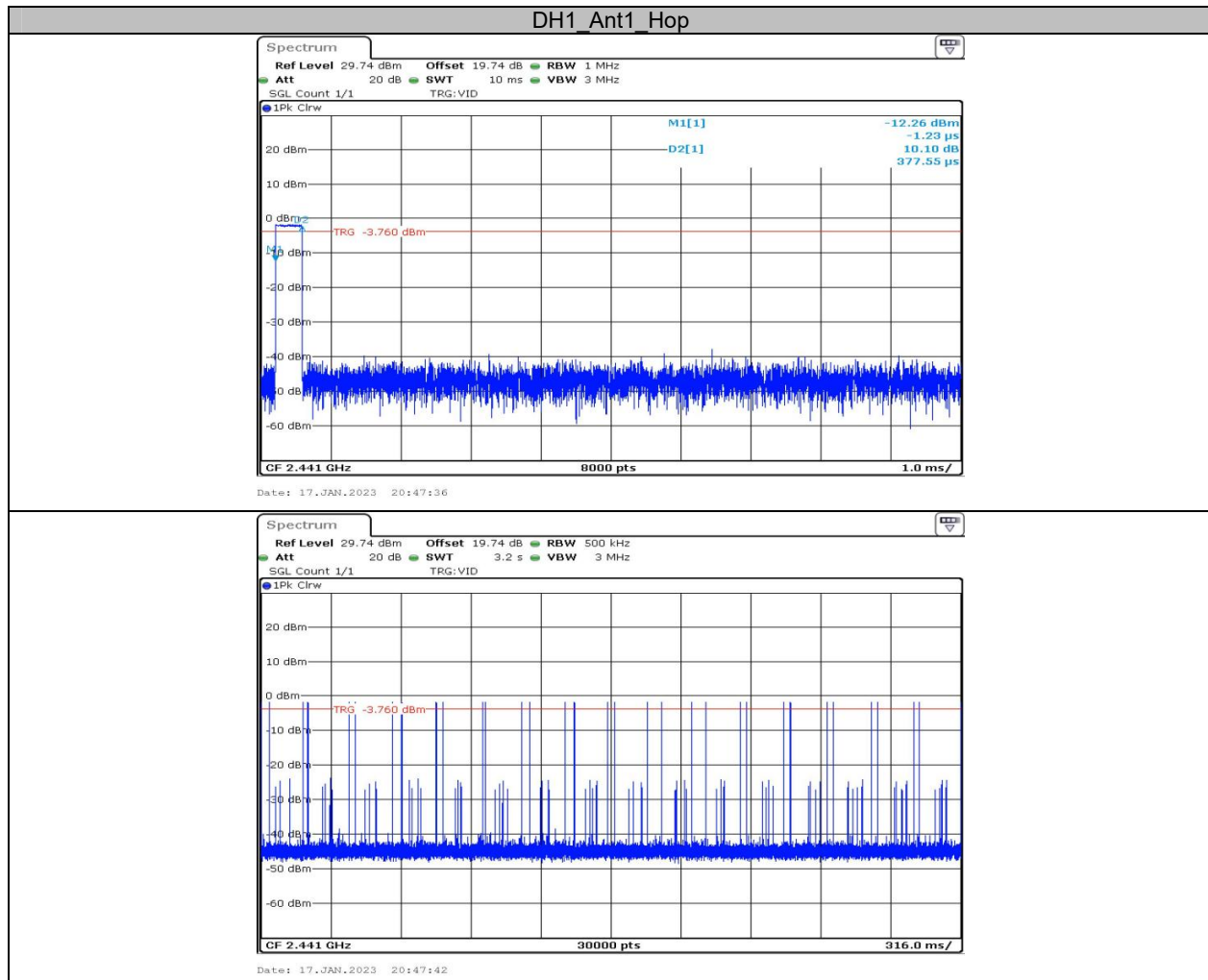
Test Mode	Antenna	Freq(MHz)	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.38	320	0.122	≤0.4	PASS
DH3	Ant1	Hop	1.63	150	0.245	≤0.4	PASS
DH5	Ant1	Hop	2.87	110	0.316	≤0.4	PASS
2DH1	Ant1	Hop	0.39	320	0.125	≤0.4	PASS
2DH3	Ant1	Hop	1.63	150	0.245	≤0.4	PASS
2DH5	Ant1	Hop	2.87	130	0.373	≤0.4	PASS

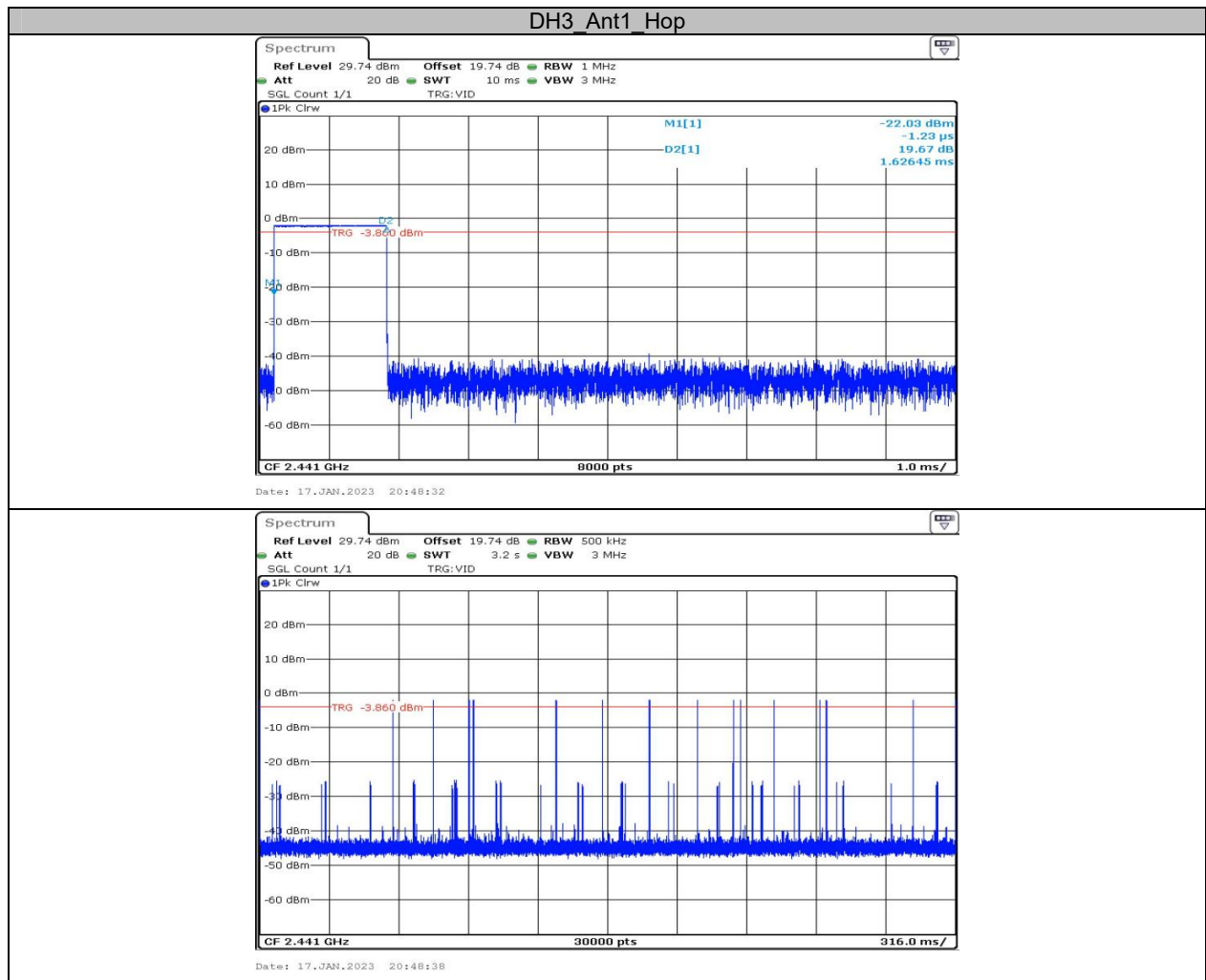
Note 1: A period time=0.4*79=31.6(S), Result=BurstWidth*Totalhops

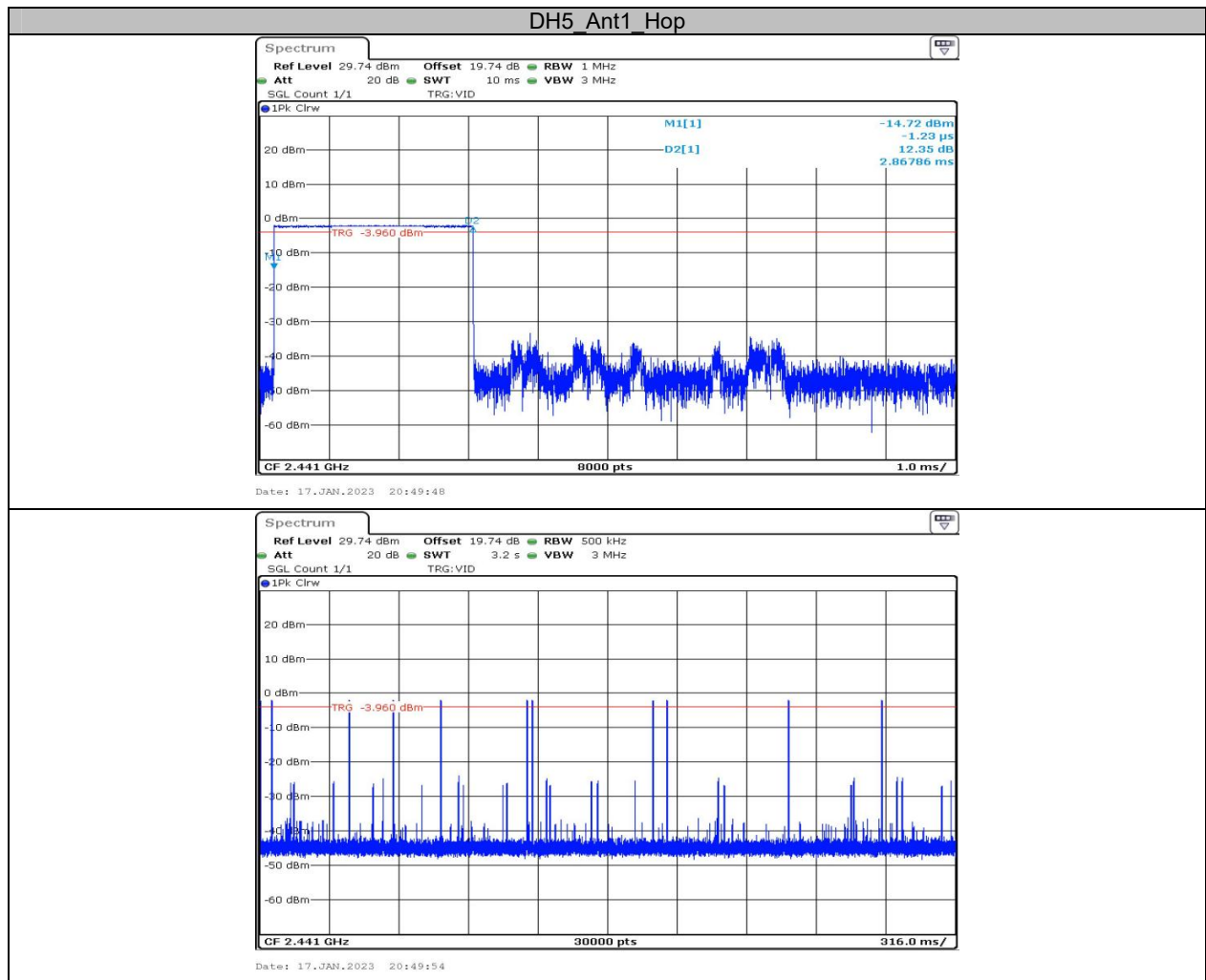
Note 2: Totalhops=Hopping Number in 3.16s*10

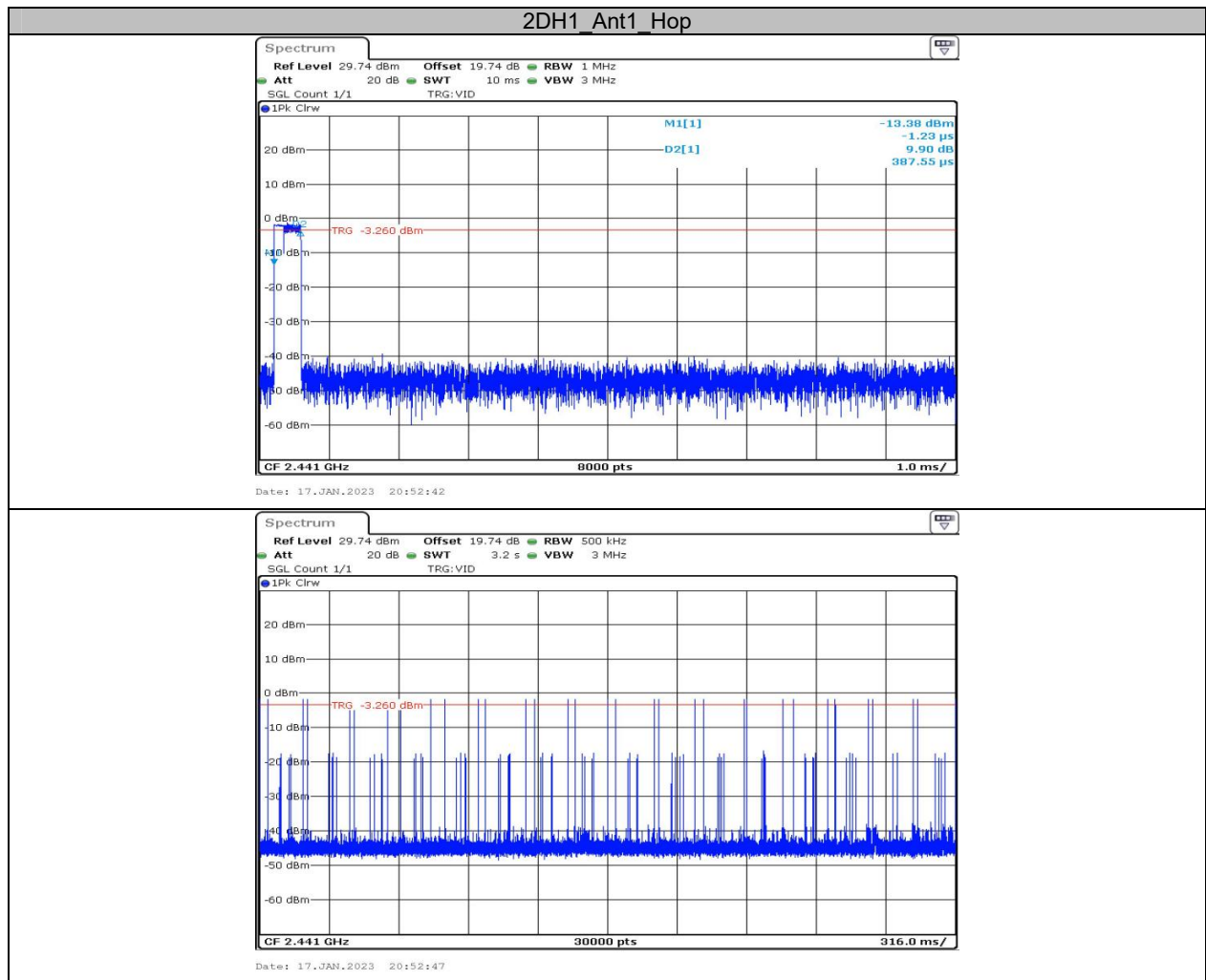
Note 3: Hopping Number in 3.16s=Total of highest signals in 3.16s(Second high signals were other channel)

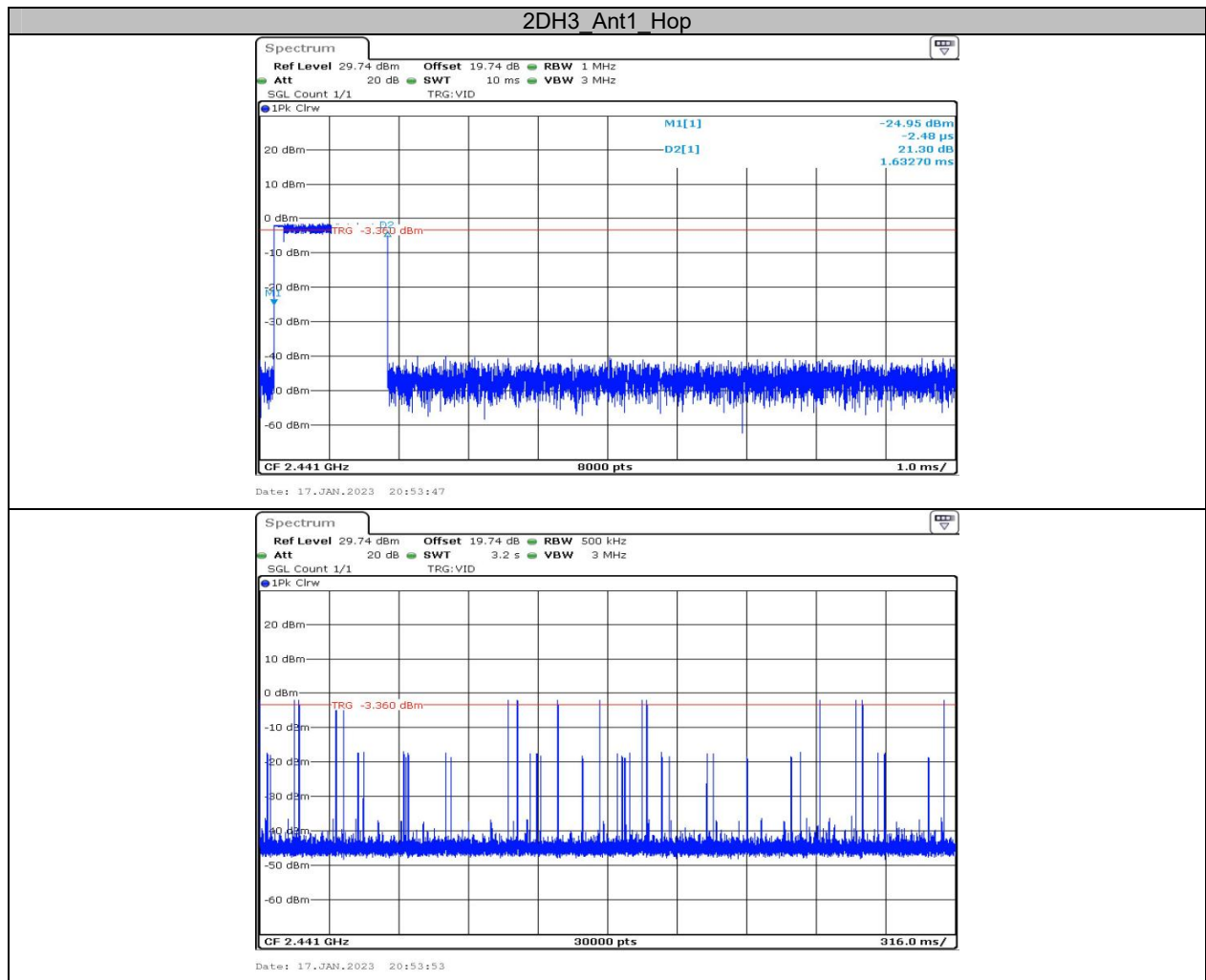
Test Graphs

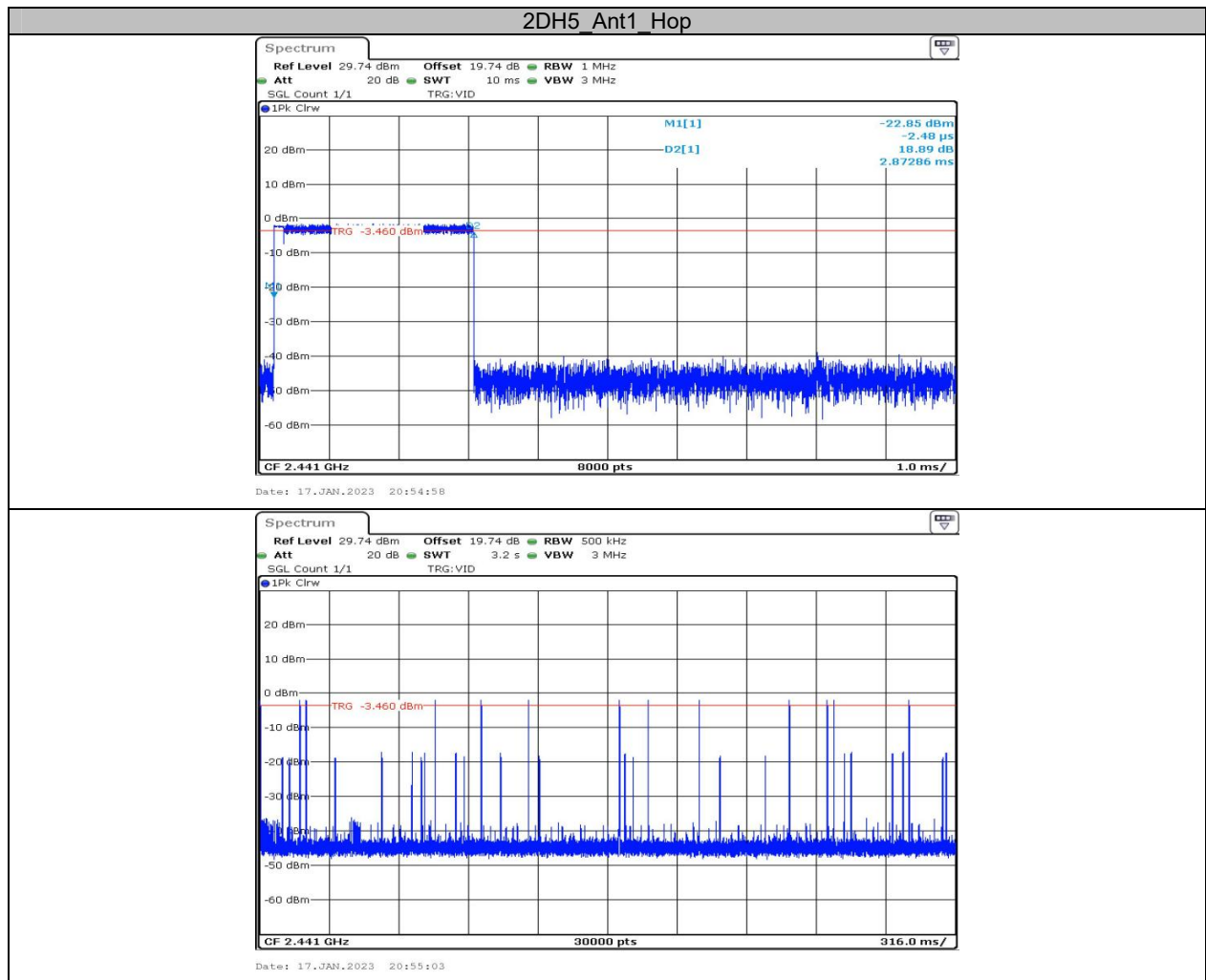








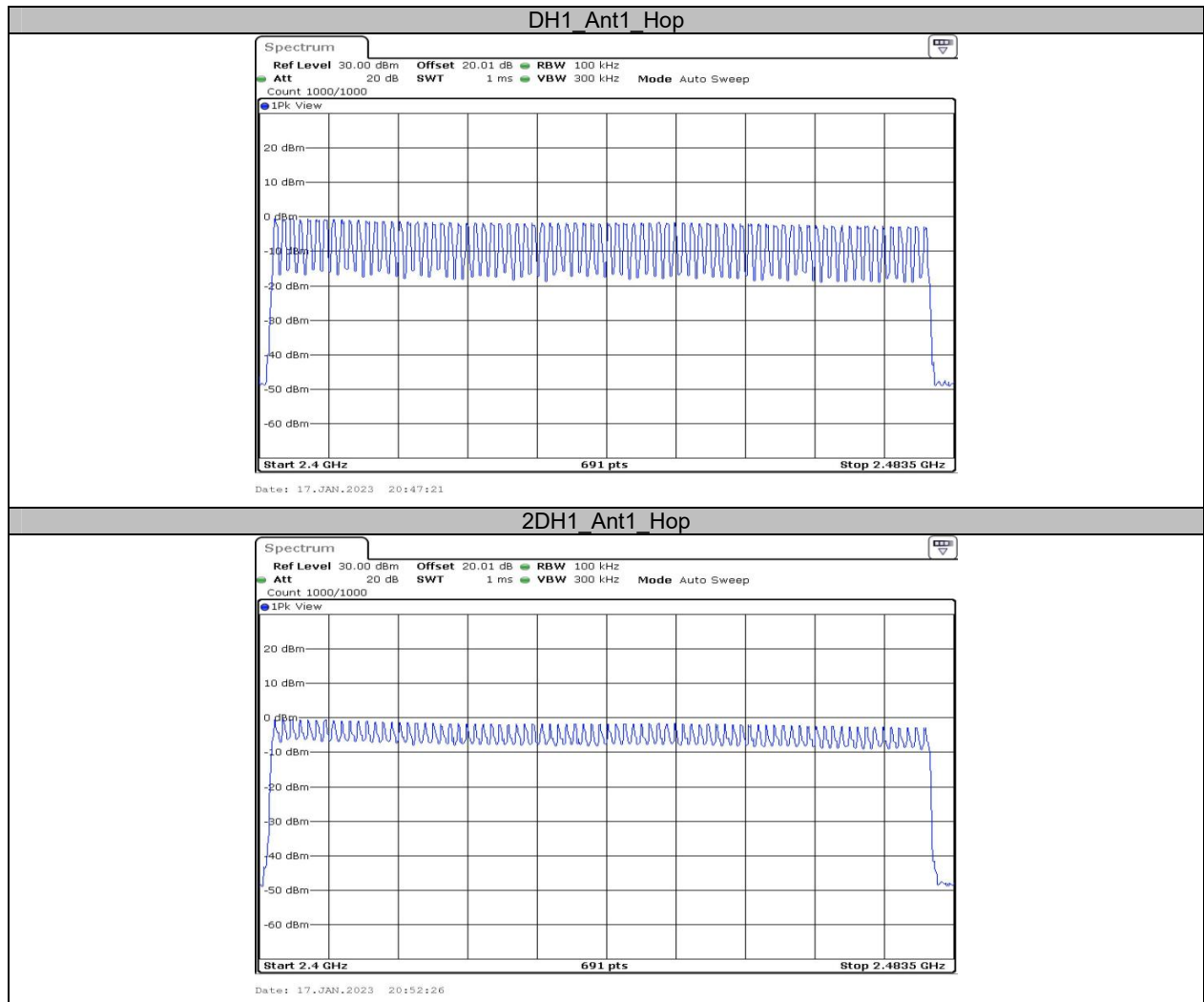




**Appendix F: Number of hopping channels
Test Result**

Test Mode	Antenna	Freq(MHz)	Result[Num]	Limit[Num]	Verdict
DH1	Ant1	Hop	79	≥15	PASS
2DH1	Ant1	Hop	79	≥15	PASS

Test Graphs



Appendix G: Band edge measurements

Test Graphs







***** END OF REPORT *****